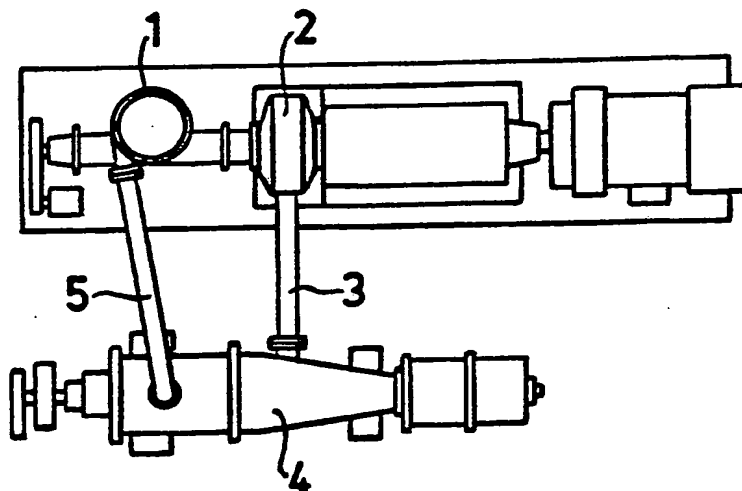




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(54) Title: METHOD AND DEVICE AT MANUFACTURE OF FIBRE PULP



## (57) Abstract

Method and installation at manufacture of fibre pulp of lignocellulose material. The material in the form of cold chips or the like is fed into and preheated in a preheater (1). Therefrom the material is fed into a defibrator (2) with a pressure housing and defibred to pulp while simultaneously generating steam. Pulp and steam flow through a blow pipe (3) to a steam separator (4) from which the pulp is discharged in the form of an air-tight pulp plug and the steam is returned to the preheater through a steam passage (5). The pressure in the system is maintained by the generated steam which produces a pressure maximum in the grinding housing while simultaneously the cold chips produce a pressure minimum in the preheater (1). The flow resistance in the blow pipe (3) and the steam passage (5) is lower than through the material feed to the defibrator (2) so that the steam flows from the defibrator (2) via the steam separator (4) to the preheater (1).

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Method and device at manufacture of fibre pulp

This invention relates to a method and an installation for the manufacture of fibre pulp.

An installatoin of this kind comprises a preheater for steam heating chips or the like. After the preheater a defibering apparatus is located where the chips are slushed and refined to pulp while simultaneously steam develops between two opposed grinding disks rotating relative to each other. Said grinding disks are enclosed by a grinding housing, in which overpressure is maintained. The pulp flows together with the steam from the grinding housing through a blow pipe to a steam separator. From said separator the pulp is fed to a subsequent device for its further processing. Since it is desirable to utilize the energy content of the separated steam it is recycled to the preheater for heating the chips. The steam separator normally is a vessel in the form of a cyclone where the steam is removed from the top and the pulp is removed from the bottom by means of a separate air-tight feeding out device, for example in the form of a plug-forming screw conveyor.

A lower pressure is maintained in the steam separator than in the grinding housing. Thereby the pulp and steam flow from the housing to the separator. The separated steam can be returned to the preheater by means of a fan or compressor so that required steam pressure and corresponding temperature can be maintained in the preheater.

It is also possible to transfer the material from the preheater to the defibrator by means of a steam proof conveyor. Thereby the steam flows from the grinding housing via the steam separator to the preheater because the steam pressure in the grinding housing is maintained at a higher level than the pressure in the preheater without steam flowing backwards from the defibrator to the preheater.

The above arrangement means that the energy content in the developed steam can be recovered in the material in the preheater by preheating to highest possible temperature. However, the disired steam transport has to be secured by fan, compressor or a steam proof feeder to the defibrator. This extra equipment is a disadvantage since it will raise the price of the installation and make it more complicated.

By surprise we have found that the method according to this invention has made it possible to recover the energy content of the steam without use of the extra equipment mentioned above in this type of installation. The invention is based on the fact that the steam generated at defibration and fibrillation of the fibre material produces a pressure maximum in the grinding housing while the cold chips fed to into the preheater produces

a pressure minimum, according to the law of cold wall. Thereby the flow, resistance in the blow pipe and the steam passage from the steam separator to the preheater is to be lower than through the conveying screw filled with chips at the bottom of the preheater.

5 It has proved to be possible to pressurize the system and to obtain the recirculation of the steam without use of fans, compressors, vents etc.

Low flow resistance in the blow pipe is obtained by making the pipe as short as possible and without valves, curves or level differences. In this connection it is especially favourable to arrange the steam separator horizontally and close to the defibrator.

10 This arrangement means that the energy losses are minimized, i.e. the energy stays within the system.

The precise characterizing features of the invention are apparent from the attached claims.

15 The invention is described in greater detail in the following with reference to an embodiment thereof illustrated in the accompanying drawings, in which Figs. 1 and 2 show an installation for the manufacture of pulp seen from the side (Fig.1) and, respectively, from above (Fig. 2), and Fig. 3 shows a steam separator according to the invention.

20 In a preheater 1 chips are heated with steam. The preheater is in its top provided with a pressure proof feeder for cold chips and at its bottom with a conveying screw feeding the chips to a defibrator 2. The defibrator comprises two opposed grinding disks, which are rotatable relative to each other and enclosed by an air-tight grinding housing.

25 At the processing of the chips in the gap between the grinding disks, great energy amounts are supplied for slushing and fibrilling the fibre material. A large part of the energy also transforms into heat, which causes evaporation of the water present at the defibration. The generated steam substantially flows from the gap out into the surrounding grinding housing. From the grinding housing extends a blow pipe 3, through which the pulp and steam flow under pressure to a steam separator 4. The steam separator is formed with an air-tight vessel 6 with circular cross-section. The vessel comprises a longitudinal screw conveyor 10 with a compressing portion 7 and an open portion 8. The inlet 3 of the blow pipe to the vessel 6 is connected in a position before the compressing portion 7 of the screw conveyor 10. The inlet 3 preferably is located tangentially in relation to the vessel 6. It can also be directed so as to form the same angle with the screw axis as the thread of the screw conveyor 10.

According to the embodiment shown, the inlet 3 is located close by the transition between the compressing portion 7 and the open portion 8 of the screw conveyor. In said open portion 8 separation of pulp and steam as well as sedimentation and collection of pulp take place, whereafter the pulp is fed to the compressing portion 7 where it is compressed to an air-tight plug and discharged from the vessel 6.

The compressing portion 7 of the screw conveyor 10 consists of an entire screw thread where the space for the pulp is reduced successively to an outlet 9. Owing to the pulp plug formed by the screw thread, the feeding out occurs air-tight, so that the pressure in the vessel 6 can be maintained. The open portion 8 of the screw conveyor 10 preferably consists of a partially open thread, for example a strip thread, which leaves an axial passage open for steam closest to the screw axel. A steam outlet 5 is connected to this portion of the vessel 6. The steam outlet 5 is coupled to the preheater 1 for utilizing the steam for preheating the chips. The screw conveyor 10 also keeps the interior of the vessel 6 clean from fibre accumulation and coatings. The vessel 6 preferably is positioned horizontally, which a.o. implies installation advantages, because the vertical space can be restricted. Vertical position or an inclination of the vessel 6 between  $0^{\circ}$  and  $90^{\circ}$  also is possible, in which case the steam outlet 5 is placed upwardly and the pulp outlet 9 downwardly.

The flow resistance in the blow pipe 3 has to be low, i.e. the pipe shall not have unnecessary vents, curves or level differences. Thereby the pulp and steam can flow from the grinding housing to the steam separator 4 with a very low pressure drop. By arranging the vessel 6 horizontally the blow pipe 3 can be short, straight and horizontal which means that the discharge of pulp from the vessel 6 will be located on the same level as the defibrator. Since the required vertical space can be restricted in such an installation there are no need for pumps and conduits for lifting the pulp from a lower level. This means considerable advantages for the installation because a defibrator is a type of apparatus which is located at the ground level since it requires a very rigid base.

Further the transfer of the separated steam through the steam passage 5 to the preheater 1 requires a very low pressure drop since no fibre material is to be carried.

By surprise we found that the steam pressure generated in the defibrator can be utilized to pressurize the whole system and at the same time secure steam flow from the defibrator via the steam separator to the preheater without the use of any fans or compressors. There is no

need for a quite pressure proof feeder to the defibrator, but an ordinary conveying screw can be used. Thus, it is sufficient if the flow resistance for the steam through the conveying screw is higher than through the blow pipe and the steam passage.

- 5       When the generated steam amount exceeds the amount required for maintaining the pressure in the system, preferably 5-12 bar, excess steam is discharged, for example via the top of the preheater 1. In other cases fresh steam can be added to the grinding housing of the defibrator 2.

10       The invention, of course, is not restricted to the embodiment shown, but can be varied within the scope of the invention idea.

Claims

1. Method at manufacture of fibre pulp of lignocellulose material including feeding the material in the form of cold chips or the like into a preheater (1), feeding the preheated material to a defibrator (2) for defibering to pulp while simultaneously generating steam, collecting the pulp in a surrounding grinding housing and maintaining a pressure in said housing, passing the pulp and steam through a blow pipe (3) to a steam separator (4), discharging the pulp in the form of an air-tight pulp plug and returning the steam through a steam passage (5) to the preheater (1) to preheat the material, c h a r a c t e r i z e d in that the generated steam produces a pressure maximum in the grinding housing and simultaneously the cold chips produces a pressure minimum in the preheater (1), the flow resistance in the blow pipe (3) and the steam passage (5) being lower than through the material feed to the defibrator (2) so that the steam flows from the defibrator (2) to the steam separator (4) and then to the preheater (1).
2. Method according to claim 1, c h a r a c t e r i z e d in that the pressure in the system is maintained by the generated steam amount and regulated by discharge of excess steam or supply of fresh steam.
3. Installation at manufacture of fibre pulp of lignocellulose material, which installation includes a preheater (1), in its top provided with a feeder for the material and in its bottom a conveying screw for feeding the material into a defibrator (2) with a pressureproof grinding housing, a blow pipe (3) from the grinding housing to a steam separator (4) comprising an air-tight vessel (6) with a longitudinal screw conveyor (10) for compression and air-tight discharge of the pulp in the form of a pulp plug and a steam outlet with a steam passage (5) to the top of the preheater (1), c h a r a c t e r i z e d in that the blow pipe (3) and the steam passage (5) are designed so that their flow resistance is lower than in the conveying screw at the bottom of the preheater (1).
4. Installation according to claim 3, c h a r a c t e r i z e d in that the steam separator (4) is horizontal, i.e. the vessel (6) is placed so that the screw conveyor (10) is horizontal.
5. Installation according to claim 4, c h a r a c t e r i z e d in that the steam separator (4) is placed close to and at the same level as the defibrator (2), whereby the blow pipe (3) is short and streight to minimize the flow resistance.
6. Installation according to any of claims 3-5, c h a r a c t e r i z e d in that the blow pipe (3) end tangentially in the vessel (6).

7. Installation according to claim 6, characterized in that the tangentially located end of the blow pipe (3) is directed so as to form the same angle with the screw axel as the thread of the screw conveyor (10).

FIG.1

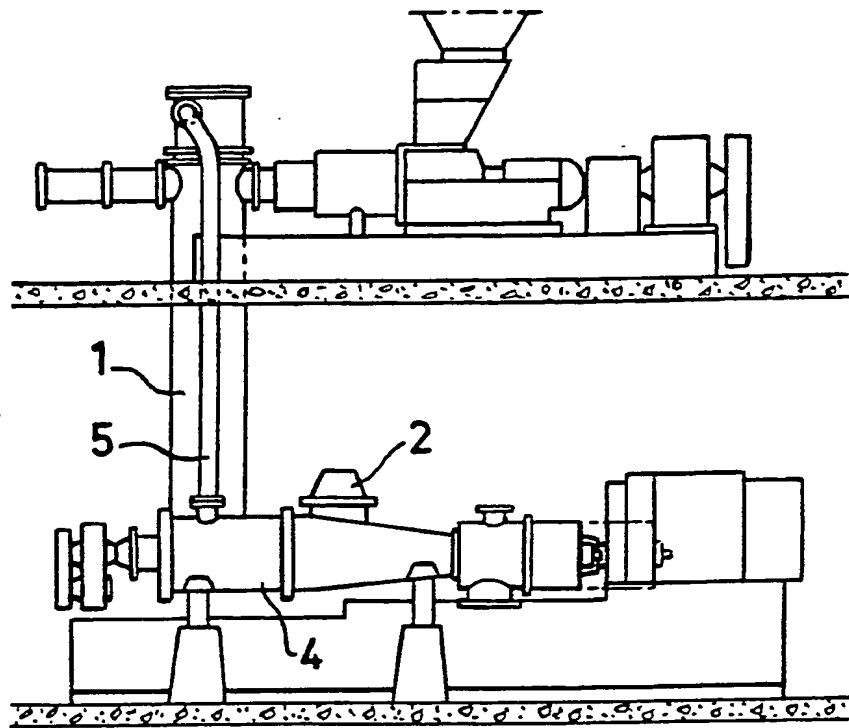


FIG.2

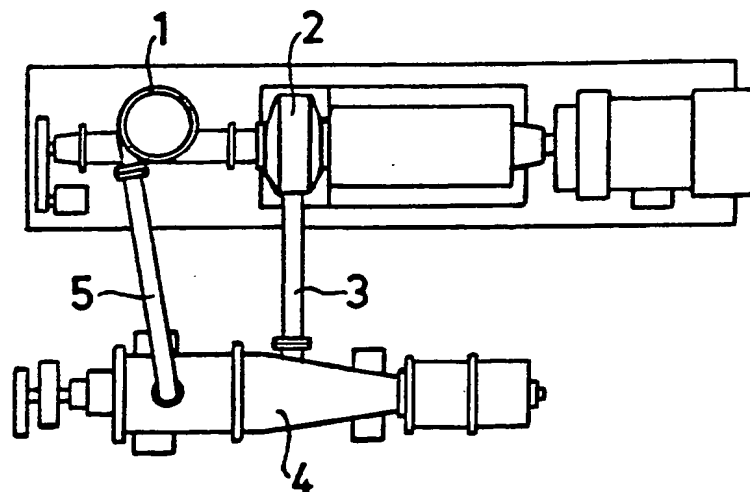
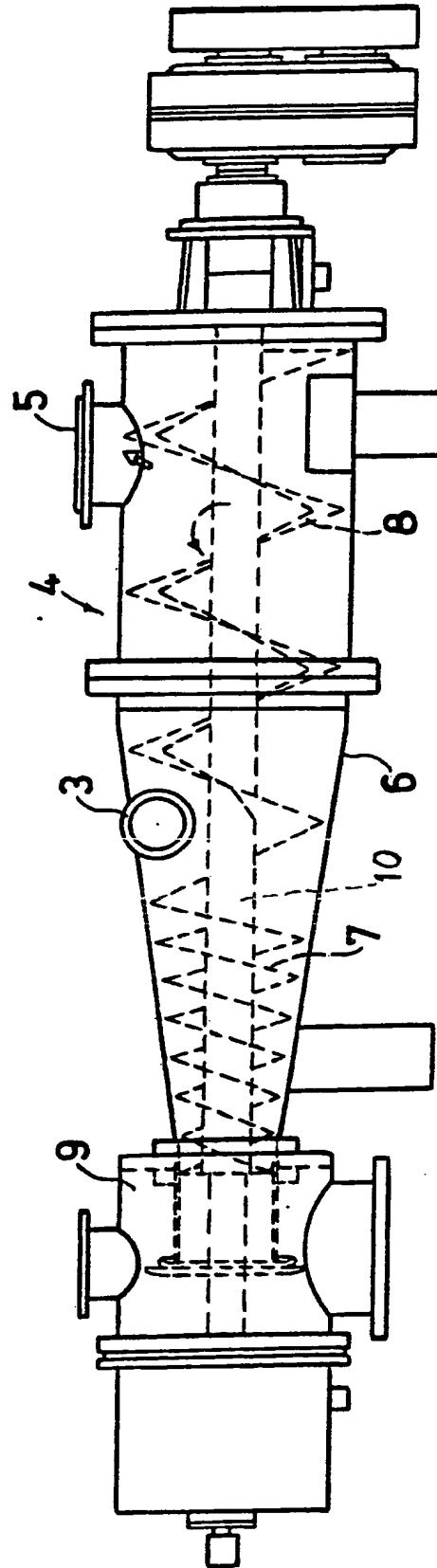


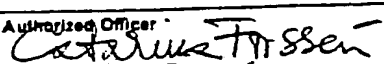
FIG.3



# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/SE88/00182

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC 4 D 21 B 1/12								
<b>II. FIELDS SEARCHED</b> Minimum Documentation Searched 7 <table border="1"> <thead> <tr> <th>Classification System</th> <th>Classification Symbols</th> </tr> </thead> <tbody> <tr> <td>IPC 4</td> <td>D 21 B 1/12, /30; D 21 D 1/00, /20, /30, /34, /38</td> </tr> <tr> <td>US CI</td> <td>55: 1, 191, 319, 401, 403, 430, 432; 162: 18, 23, 28; 241: 246, 247</td> </tr> </tbody> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8 SE, NO, DK, FI classes as above			Classification System	Classification Symbols	IPC 4	D 21 B 1/12, /30; D 21 D 1/00, /20, /30, /34, /38	US CI	55: 1, 191, 319, 401, 403, 430, 432; 162: 18, 23, 28; 241: 246, 247
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US CI	55: 1, 191, 319, 401, 403, 430, 432; 162: 18, 23, 28; 241: 246, 247							
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> 9								
Category *	Citation of Document, 11 with Indication, where appropriate, of the relevant passages 12	Relevant to Claim No. 13						
X	SE, B, 411 133 (AB BAHCO VENTILATION) 3 December 1979 & CA, 1101257	1-3						
X	SE, B, 413 784 (ISEL SA) 23 June 1980 & FR, 2360711 DE, 2734832 US, 4136831 JP, 53041501 CA, 1063407	1-3						
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Date of the Actual Completion of the International Search 1988-06-16		Date of Mailing of this International Search Report 1988 -07- 06						
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
X	SE, B, 420 224 (SUNDS DEFIBRATOR AB) 21 September 1981	1-2
X	SE, B, 420 226 (SUNDS DEFIBRATOR AB) 21 September 1981 & FR, 2474551 JP, 56134288 DE, 3107259 US, 4350499 CA, 1143298 AU, 540881	1-7
X	SE, B, 422 340 (DEFIBRATOR AB) 1 March 1982 & DE, 2941504 JP, 55057089	1-7
X	SE, B, 429 874 (SUNDS DEFIBRATOR AB) 3 October 1983 & WO, 83/02788 EP, 0113353	1-3
X	SE, B, 444 588 (AB. BAHCO VENTILATION) 21 April 1986	1-3
Y	FI, B, 58 171 (OY KESKUSLABORATORIO-CENTRAL- LABORATORIUM AB) 29 August 1980	1-7
Y	US, A, 4 350 499 (LUNDGREN) 21 September 1982 & FR, 2474551 JP, 56134288 DE, 3107259 CA, 1143298 SE, 420226 AU, 540881	1-7

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